

REMARKS

With the entry of this Amendment, claims 1, 3-10, 12-14 and 16-22 will be pending in this patent application.

In this paper, claims 2, 11 and 15 have been canceled, claims 1, 3-6, 9, 12-14, 16-18 and 20 have been amended and claims 21 and 22 have been added.

OBJECTIONS TO CLAIMS

In this paper, Applicant has made amendments to claims 3, 9 and 13-17 that obviate the Examiner's objections to those claims. In claims 3, 9 and 13, the "and/or" expression has been changed to --or--, as interpreted by the Examiner. In claims 14 and 16, the "receiving/providing" expression has been changed to --receiving or providing--, and the "received/provided by/from" expression has been changed to --received, provided by and from--, as interpreted by the Examiner.

In view of the amendments to claims 3, 9, 13, 14 and 16 presented herein, Applicant requests that the objections to the claims be withdrawn.

PRIOR ART REJECTION I

Claims 1-4, 6-12 and 20 were rejected under 35 USC § 102(b) as being anticipated by US 6411046 B1 (Muthu). Applicant traverses this rejection insofar as it might be deemed applicable to claims 1, 3, 4, 6-10, 12 and 20 as now presented.

Claims 1, 4, 6, 9, 12 and 20 have been amended to incorporate a "substantially linear function of the temperature" similar to the limitation that had been recited in claim 11.

Muthu discloses a "white light emitting luminaire where the light output and the color of the white light produced by the luminaire vary with temperature" (column 1, lines 6-11). More particularly, per column 1, lines 40-52,

First, electrical current is supplied to the LEDs in each color, so that they have a light output with a nominal continuous value during ordinary operation. Then CIE xy coordinates for each LED light source are *measured for different temperatures*. The CIE xy coordinates for the LED light sources are *expressed as a function of*

temperature of the LED light source and the expressions are stored in memory.

Equations are derived for the CIE x and CIE y coordinates as a function of temperature and are used to calculate the CIE xy coordinates and lumen output fractions *while on line*. Light output and color of the LEDs is controlled based upon the calculated xy coordinates and lumen output fraction" (emphasis added).

That is, at first, Muthu teaches (1) on-line or real time detection of heat sink temperature (as LED temperature); (2) then calculating or converting the temperature into CIE xy coordinates (chromaticity); and (3) determination of LED lumen output based on function of

$$\begin{bmatrix} \frac{x_w}{y_w} L_w \\ \frac{1}{y_w} L_w \\ L_w \end{bmatrix} = \begin{bmatrix} \frac{x_R}{y_R} & \frac{x_G}{y_G} & \frac{x_B}{y_B} \\ \frac{1}{y_R} & \frac{1}{y_G} & \frac{1}{y_B} \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} L_R \\ L_G \\ L_B \end{bmatrix} \quad (1)$$

In other words, the technique disclosed by Muthu requires two-step conversion: (a) LED temperature into LED chromaticity and (b) LED chromaticity into LED output (drive current), which is time-consuming and entails large consumption of power and resources and tends to increase error due to the double conversion.

By contrast, Applicant's disclosed and claimed light emitting apparatus, LED lighting and control method employs a simpler and straightforward calculation of temperature into drive current, which can be realized using less hardware and smaller-sized memory.

Regarding claim 11, the examiner states (on page 9 of the Office Action), "Muthu teaches the predetermined function of the temperature variation represents that the drive current is a linear function of the temperature (col. 2 lines 12-25, and linear functions of col. 5 lines 16-22)." However, Muthu discloses a linear function of *the temperature and CIE x (y) coordinates* (chromaticity), as shown in its Figs. 3A-4B. Muthu cannot be fairly characterized as disclosing a linear function in which *drive current* is related with temperature, as required by amended claims 1, 4, 6, 9, 12 and 20, and Muthu cannot be fairly characterized as disclosing a straightforward conversion from temperature into drive current.

In view of the foregoing observations, Applicant submits that the disclosure in Muthu cannot properly serve as a basis for rejecting any of claims 1, 3, 4, 6-10, 12 and 20, as now presented, under 35 USC § 102(b).

PRIOR ART REJECTION II

Claim 5 was rejected under 35 USC § 103(a) as being unpatentable over Muthu in view of US 2003/0011553 A1 (Ozaki). Applicant traverses this rejection insofar as it might be deemed applicable to claim 5 as now presented.

The Examiner acknowledges that Muthu does not offer a disclosure of a drive time detector, as required by claim 5. The Examiner cites Ozakai for its disclosure of "controlling the time an LED is on in order to compensate for reduction of brightness. The Examiner contends that the disclosure in Ozakai would have made obvious a modification of the Muthu controller in which a drive time detector is used to control the duration of an LED ON-time.

Like claims 1, 4, 6, 9, 12 and 20, claim 5 has been amended to incorporate a "substantially linear function of the temperature" similar to the limitation that had been recited in claim 11.

Applicant notes that Ozakai offers no remedy for deficiencies in the Muthu disclosure vis-à-vis the requirements of amended claim 5, for reasons that are made evident in the discussion of PRIOR ART REJECTION I above. Also, while Ozakai offers a general disclosure of adjusting light output for "secular variation," Applicant does not find in Ozakai a clear disclosure of a drive time detector that could be employed in the Muthu controller, as apparently proposed by the Examiner. Applicant therefore submits that the modification of the Muthu controller proposed by the Examiner would not have been obvious.

In view of the foregoing observations, Applicant submits that no reasonable combination of the disclosures in Muthu and Ozaki can properly serve as a basis for rejecting claim 5, as now presented, under 35 USC § 103(a).

PRIOR ART REJECTION III

Claim 13 was rejected under 35 USC § 103(a) as being unpatentable over Muthu in view of Ozaki and US 2002/0175632 A1 (Takeguchi) and further in view of the IEEE "White Light

Emission" article authored by Sheu et al. (per the Examiner, "Sheu"). Applicant traverses this rejection insofar as it might be deemed applicable to claim 13 as now presented.

As acknowledged by the Examiner, Muthu does not "teach a drive time detector or the fourth LED to be a white LED." As a remedy for these acknowledged deficiencies in the Muthu disclosure vis-à-vis the requirements of Applicant's claims, the Examiner cites Ozakai and Takeguchi. The Examiner also acknowledges that the disclosures in Muthu, Ozakai and Takeguchi do not "teach the material characteristics of the white LED." The Examiner cites Sheu for its disclosure of "a white LED that can emit white light (Sheu, pg. 18, abstract) and is composed of a semiconductor light emitting element capable of emitting UV rays (Sheu, pg. 18, col 2, 1st para) and a phosphor emitting radiation caused by excitation of light emitted from the semiconductor light emitting element (Sheu, pg. 19, col. 1, 1st para in the middle, where it says that the LED chips pump phosphors)." The Examiner concludes, "it would also have been obvious to one of ordinary skill in the art at the time of the invention, to use a UV white LED which emits phosphors (as taught by Sheu), to obtain the added benefit of using a more optically stable white LED (as taught by Sheu in the abstract)."

Like claims 1, 4-6, 9, 12 and 20, claim 13 has been amended to incorporate a "substantially linear function of the temperature" similar to the limitation that had been recited in claim 11.

The Examiner's proposal to modify the Muthu controller in view of the teachings in Ozakai is addressed above in the discussion of PRIOR ART REJECTION II. Without acquiescing in the Examiner's proposal to further modify the Muthu controller in view of the teachings in Takeguchi and Sheu, Applicant observes that there are no teachings in Takeguchi or Sheu that could remedy deficiencies in the Muthu disclosure vis-à-vis the requirements of amended claim 13, for reasons that are made evident in the discussion of PRIOR ART REJECTION I above.

In view of the foregoing observations, Applicant submits that no reasonable combination of the disclosures in Muthu, Ozaki, Takeguchi and Sheu can properly serve as a basis for rejecting claim 13, as now presented, under 35 USC § 103(a).

PRIOR ART REJECTION IV

Claims 14 and 16-19 were rejected under 35 USC § 103(a) as being unpatentable over Muthu in view of US 2003/0016198 A1 (Nagai et al.). Applicant traverses this rejection insofar as it might be deemed applicable to claims 14 and 16-19 as now presented.

Claim 14 has been amended to incorporate the limitations that had been recited in claim 15. Applicant notes that claim 15 was not subjected to a rejection and submits therefore that none of the prior art of record satisfies or render obvious the requirements of amended claim 14 and dependent claim 19.

The Examiner acknowledges that "Muthu does not explicitly teach control circuit writing color information at power startup, or DACs from the calculation circuit."

Like claims 1, 4-6, 9, 12, 13 and 20, claims 16 and 18 have been amended to incorporate a "substantially linear function of the temperature" similar to the limitation that had been recited in claim 11.

The Examiner cites Nagai et al. for its disclosure of "performing driving control of the LED currents (Nagai, para. 103) by controlling light variation based on chromaticity (Nagai, abstract) by powering on/off the main current (Nagai, para. 103), and also, DACs for chromaticity correction (Nagai, para. 133)." The Examiner concludes, "it would have been obvious to one of ordinary skill in the art at the time of the invention, to perform control at power startup in Muthu's apparatus to obtain the benefit of chromaticity correction in one image of an image frame period (Nagai, para. 153), and furthermore, it would also have been obvious to use DACs to supply the chromaticity information from Muthu's controllers to the current drivers (Muthu's Fig. 1) to enable current supply to the LEDs with the chromaticity correction."

Without acquiescing in the Examiner's proposal to modify the Muthu controller in view of the teachings in Nagai et al., Applicant observes that there are no teachings in Nagai et al. that could remedy deficiencies in the Muthu disclosure vis-à-vis the requirements of amended claims 16 and 18, for reasons that are made evident in the discussion of PRIOR ART REJECTION I above.

In this paper, claim 17 has been rewritten in independent form in order to properly recite the cubic functions. As to claim 17, the Examiner acknowledges that Muthu does not "explicitly teach cubic functions." The Examiner points to the disclosure in column 4, line 42-44, and

column 4, line 65, through column 5, line 7, as offering a disclosure that would have made obvious the use of a cubic function in the Muthu technique. Applicant observes, as the Examiner has, that Muthu does not disclose the use of a cubic function. Applicant has reviewed the passage in Muthu identified by the Examiner and submits that it is so vague and general as to not qualify properly as a basis for modifying the Muthu technique to incorporate cubic functions as specifically required by Applicant's claim 17.

In view of the foregoing observations, Applicant submits that no reasonable combination of the disclosures in Muthu and Nagai et al. can properly serve as a basis for rejecting any of claims 14 and 16-19, as now presented, under 35 USC § 103(a).

ALLOWABILITY OF NEW CLAIMS

Support for the subject matter recited in new claim 21 can be found in the specification in paragraph [0132], and support for the subject matter recited in new claim 22 can be found in paragraph [0131].

Applicant submits that none of the disclosures in the prior art of record can meet or make obvious the straightforward control of the drive currents from pre-stored data representing a relation between temperature and current, as required by claim 21. Claim 22 is allowable at least by virtue of its dependence from claim 1, which Applicant has shown to be allowable.

OTHER PRIOR ART

Applicant has considered the other prior art cited by the Examiner. Applicant is not commenting on this prior art, because it was not applied against the claims in this application.

CONCLUSION

In view of the amendments, observations and arguments presented herein, Applicant respectfully requests that the Examiner reconsider and withdraw the objections and rejections stated in the outstanding Office Action and recognize all of the pending claims as allowable.

If unresolved matters remain in this application, the Examiner is invited to contact Frederick R. Handren, Reg. No. 32,874, at the telephone number provided below, so that these matters can be addressed and resolved expeditiously.

Application No. 10/566,216
Amendment dated February 12, 2009
Reply to Office Action of November 12, 2008

Docket No.: 5232-0103PUS1

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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